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NEW SPECIES OF LOUISIANA APHIDIDAE, AND NOTES ON *Sanbornia juniperi* Pergande [1]

By H. BRUCE BOUDREAUX [2]

Five species are here described as new, and a redescription of *Sanbornia juniperi* Pergande is presented. The types of the new species are in the collection of the writer at Louisiana State University. The measurements given are in millimeters.

The species in question have been examined by the following, for whose opinions concerning the identity of the specimens the writer is deeply grateful: A. N. Tissot, Gainesville, Florida (all five new species); P. W. Mason, Washington, D. C. (*Macrosiphum tissoti* and *M. verbesinae*); A. C. Maxson, Longmont, Colorado (*Georgiaphis maxsoni*) and H. H. Ross, Urbana, Illinois (*M. verbesinae*, compared with type of *M. ruralis* H. & F.).

Cinara louisianensis new species

COLOR.—Alate viviparae green; head dusky green; eyes black; ocelli black-bordered; antennae dusky black, with bases of segments paler; head powdery below; rostrum green, tinged with dusky, black at tip. Thorax dull green to dusky black, brown between lobes; coxae green, femora green at base, becoming dusky brown at apex; tibiae lightly infuscated, dark at tips; tarsi similar in color to tibiae. Abdomen dark green with transverse powdery areas behind cornicles; cornicles light brown; cauda and anal plate lightly infuscated. Apterous viviparae similar to alatae except that the first three antennal segments are lighter, the white powdery areas are scattered more widely over the abdomen and the thorax is green.

MEASUREMENTS.—Alate vivipare.—Length of body, 1.8 to 2.03; width across eyes, .49 to .50; antennal III, .21 to .22; IV, .10 to .12; V, .11 to .13; VI, .11 to .12 plus .02; width of cornicle base, .14 to .20; rostral

[1] Contribution from the Department of Zoology, Physiology and Entomology, Louisiana State University, Baton Rouge, Louisiana. Contribution No. 90.

[2] Aided by research grant from the American Association for the Advancement of Science through the Louisiana Academy of Sciences.

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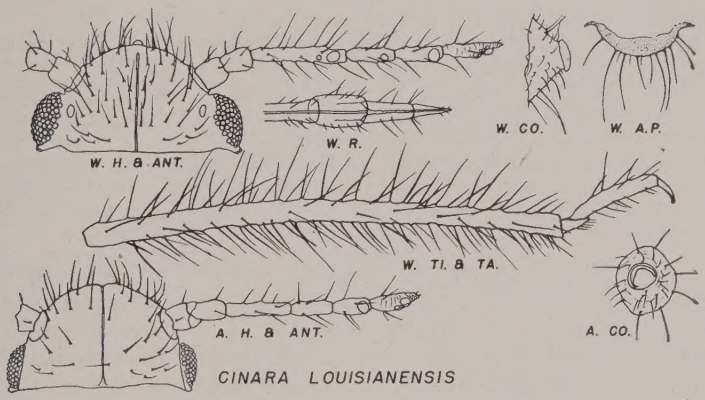
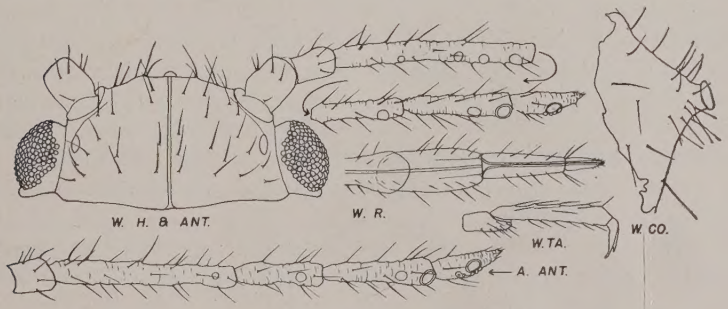
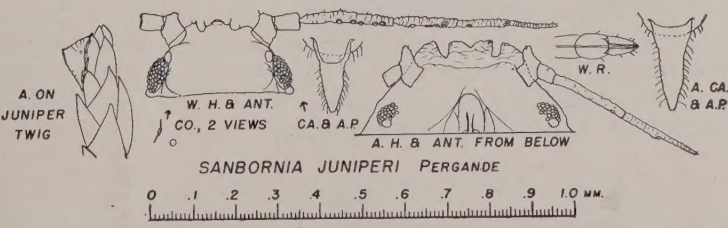
PLATE I







A.—Apterous viviparous female
W.—Winged viviparous female
ANT.—Antenna
A.P.—Anal plate
CA.—Cauda
CO.—Cornicle
R.—Rostrum
TA.—Tarsus
TI.—Tibia
H.—Head

IV plus V, .15 to .21; hind tibia, 1.04 to 1.15; hind tarsus, .25 to .29. Apterous viviparae.—Length of body, 1.66 to 2.10; across eyes, .44 to .48; antennal III, .16 to .20; IV, .08 to .11; V, .09 to .12; VI, .10 to .13 plus

.02; width of cornicle base, .14 to .16; rostral IV plus V, .17 to .21; hind tibia, .75 to .88; hind tarsus, .22.

STRUCTURAL CHARACTERS.—Antennae short, about half as long as the body; secondary sensoria near tips of segments, 1 to 4 on III, 0 to 1 on IV, 0 to 1 on V, and none on VI of alatae; apterae without secondary sensoria; the primary sensorium on VI with 3 or 4 accessory sensoria near it; vertex prominently convex; fore wings with media usually once forked, some specimens having it twice forked on only one side, others having it twice forked on both sides; media less prominent than other veins; both media and cubitus present in hind wings; cornicles small for the genus.

TAXONOMY.—This species can be separated from the other Louisiana Aphid which feeds on Arborvitae, *Cinara tujafilina* (Del Guercio), by its smaller size, its green color instead of brown, and by the usually once-forked media. *C. louisianensis* has fewer secondary sensoria on III and lacks the brown dorsal abdominal markings of *C. tujafilina*. It differs from *C. utahensis* Knowlton in that the alates have more secondary sensoria on antennal segment III, the apterae are without secondary sensoria and there are much fewer and shorter hairs on the antennae. From *C. occidentalis* Davidson it differs in having much shorter antennae and tarsal segments and more protuberant vertex.

NOTE.—Specimens of this species are very hard to see on the green branches of Arborvitae. They were collected by breaking off the branches and placing them under a strong light, which makes them more active, whereupon they can easily be seen and taken.

Holotype alate vivipara on slide with morphotype apterous vivipara (marked) and one paratype apterous vivipara, collection number L-245-46. Collections as follows: L-245-46, Baton Rouge, La., February 23, 1946; L-254-46, Baton Rouge, February 24, 1946; L-267-46, Lafayette, La., March 4, 1946; L-280-46, Baton Rouge, March 15, 1946. All on *Thuja* sp. (Arborvitae), collected by the writer.

Cinara melaina new species

COLOR.—Alate viviparae very dark shiny brown, almost black. Head, thorax and eyes black; antennal I and II black, basal part of III, IV and V whitish, distal two-thirds of III, tip of IV, almost all of V and all of VI black; legs black except bases of femora and middle portions of tibiae, which are yellowish brown; hind tibiae with yellowish portion short and near basal end; rostrum whitish at base, III, IV and V black; wings light smoky, costal margin black; posterior border of both wings black; abdomen very dark brown; cornicles, cauda and anal plate black; slight powdery secretion on lower thoracic lobes, scutellum and side of thorax. On some

specimens the powdery secretion is more extensive and covers a large part of the body. Apterous viviparae very dark shiny brown (black to naked eye); antennae, legs and head as in alate; pro- and mesothorax black, a pair of oblong black patches on metathorax and first abdominal segment; numerous black irregular patches around hair bases on abdomen; spiracles black with a white powdery spot posterior to each; cornicles black on steeply sloping bases; posterior abdominal segments black.

MEASUREMENTS.—Alate viviparae.—Length of body, 2.63 to 3.20; across eyes, .62 to .72; antennal III, .42 to .51; IV, .17 to .24; V, .21 to .27; VI, .11 plus .05; rostral IV plus V, .27 to .29; width of cornicle base, .29 to .53; hind tibia, 1.90 to 2.36; hind tarsus, .33 to .35. Apterous viviparae.—Across eyes, .70 to .74; antennal III, .42 to .49; IV, .18 to .22; V, .22 to .25; VI, .11 to .12 plus .04 to .05; rostral IV plus V, .28 to .30; width of cornicle base, .44 to .63; hind tibia, 2.0 to 2.26; hind tarsus, .33.

STRUCTURAL CHARACTERS.—Secondary sensoria 3 to 7 on III, 1 to 3 on IV and 1 on V in alatae, 1 each on III, IV and V in apterae; rostrum in alatae reaching cornicles; media of fore wings faint, with the second fork much closer to the first fork than to the end of M_1, the branches of the first and second forks running close together and nearly parallel; cornicle bases bearing a few long hairs, with steeply sloping sides. The cornicle hairs are arranged in two groups as follows: a circle of hairs around the base of the cone, with another circle of hairs grouped around the apex. There is usually an area between these groups without hairs.

TAXONOMY.—*Cinara melaina* is very similar to *C. carolina* Tissot, but can be distinguished from it by its usually nearly black, shiny color, fewer average number of secondary sensoria, smaller and more sloping cornicle bases in the alate form, with fewer hairs on the cornicles, and the close apposition of the second and third branches of the media in the fore wings. The apterae of *C. melaina* bear two transverse pigmented areas on the dorsum posterior to the cornicles. Such a condition is also found in *C. carolina,* but in the latter the more anterior transverse area is divided into two separate areas. From *C. osborniana* Tissot, *C. melaina* differs in having much shorter antennal and tibial hairs, more sensoria on III of alatae, and in lacking the irregular large pigmented areas on the dorsum of the apterae.

Holotype alate vivipara on slide, collection number L-252-46. Morphotype apterous vivipara on slide with one alate, collection number L-251-46. Collections as follows: L-42-45A, February 18, 1945 on *Pinus taeda;* L-44-45C, March 12, 1945, *P. glabra;* L-45-45, March 17, 1945, *P. glabra;* L-46-45, March 17, 1945, *P. palustris;* L-251-46, February 24, 1946, *P. glabra;* and L-252-46, February 24, 1946, *P. caribaea;* all these at Baton Rouge. One collection from Jackson, La., L-319-46, April 4,

1946 on *P. taeda,* mixed in a colony of *Cinara carolina* Tissot. All collected by the writer.

Macrosiphum tissoti new species

COLOR.—Body green; cornicles, legs and antennae black; cauda light.

MEASUREMENTS.—Alate viviparae.—Body, 2.33 to 3.23; across eyes, .45 to .51; antennal III, .73 to .98; IV, .60 to .84; V, .55 to .80; VI, .14 to .15 plus 1.08 to 1.25; hind tibia, 1.95 to 2.80; rostral IV plus V, .18; cornicle, .51 to .85; reticulations on cornicle, .20 to .40; cauda, .39 to .65. Apterous viviparae.—Body, 2.40 to 3.05; across eyes, .51 to .55; antennal III, .84 to 1.00; IV, .75 to .83; V, .63 to .76; VI, .15 to .17 plus 1.00 to 1.16; hind tibia, 2.27 to 2.68; cornicle, .70 to .88; reticulations on cornicle, .29 to .38; cauda, .58 to .70.

STRUCTURAL CHARACTERS.—Hairs pointed or slightly capitate; reticulations on cornicles covering about two fifths of the cornicle length; cauda narrow and pointed beyond last pair of lateral hairs; secondary sensoria scattered, tuberculate, covering all of III in alatae and the basal one half to two thirds of III in apterae. Secondary sensoria on III, 34 to 51 in alatae, 26 to 35 in apterae; antennal III much shorter than combined lengths of IV plus V, about two thirds the length.

TAXONOMY.—This species runs to *M. luteola* Williams in Patch's key (1919). It differs from *M. luteola* in being green instead of yellow, has a proportionately shorter antennal III and a larger number of larger secondary sensoria.

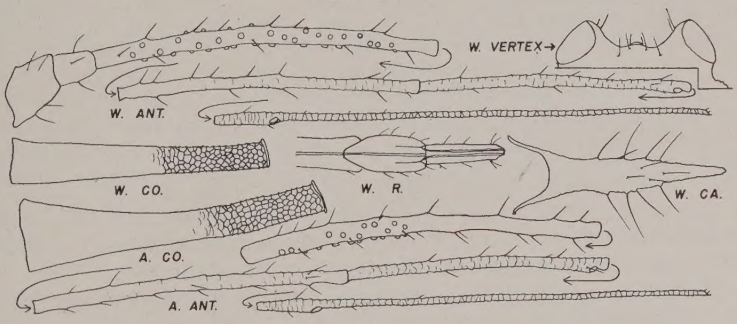
NOMENCLATURE.—This species is named in honor of Dr. A. N. Tissot, of Gainesville, Florida. Dr. Tissot has for long been a leading authority on Southern Aphids and has freely given the writer his most valuable help in studying Louisiana Aphids.

Holotype alate vivipara, dorsal view, on slide with morphotype apterous vivipara and paratype alate vivipara seen from side view, collection number L-146-45, September 6, 1945, on *Solidago.* Collections as follows: 216-La., Lafayette, La., May 21, 1936, on *Solidago;* L-17-40, Baton Rouge, La., June 18, 1940, on *Solidago;* L-3-42, Lafayette, April 18, 1943, on *Solidago;* L-4-42, Lafayette, April 18, 1942, on *Aster.* All collected by D. C. Elliott. L-118-45, Baton Rouge, August 11, 1945; L-139-45, Baton Rouge, September 2, 1945; L-146-45, Baton Rouge, September 6, 1945, all on *Solidago* and collected by the writer. Thirty-five individuals on 12 slides.

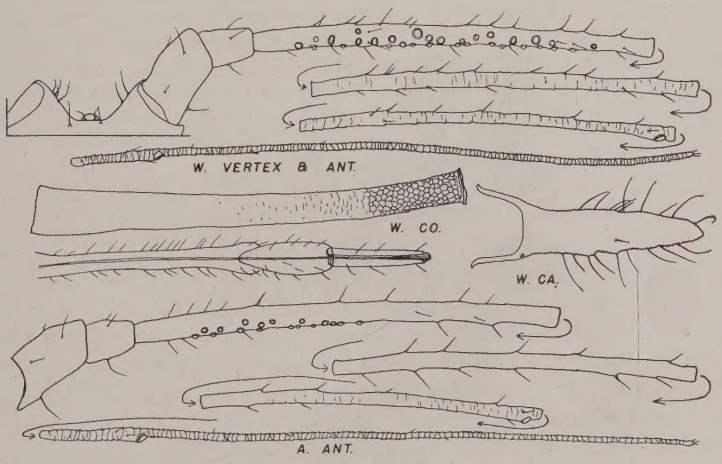
Macrosiphum verbesinae new species

COLOR.—Shiny black or bright shiny red; bases of femora yellow, the rest of the legs black; antennae black; ocelli bordered with black in red

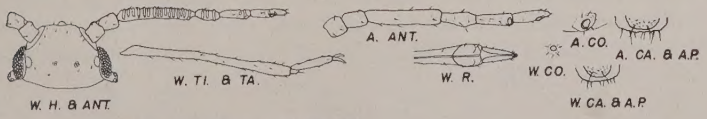
PLATE II



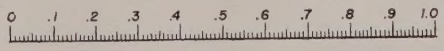
MACROSIPHUM TISSOTI



MACROSIPHUM VERBESINAE



GEORGIAPHIS MAXSONI



forms; eyes dark brown; rostrum black; red apterous forms with dusky patches around the cornicle bases; cornicles and cauda entirely black. Both red and black varieties show the same cuticular pigmentation when cleared.

MEASUREMENTS.—Alate viviparae.—Body, 2.00 to 2.95; across eyes, .50 to .59; antennal III, .65 to 1.00; IV, .60 to .95; V, .62 to .95; VI, .16 to .27 plus 1.03 to 1.40; hind tibia, 2.00 to 2.78; rostral IV plus V, .23; cornicle, .82 to 1.10; reticulations on cornicles, .22 to .28; cauda, .31 to .56. Apterous viviparae.—Body, 2.35 to 3.24; across eyes, .50 to .61; antennal III, .78 to .98; IV, .65 to .86; V, .58 to .85; VI, .15 to .25 plus 1.02 to 1.29; hind tibia, 2.10 to 2.80; cornicle, .85 to 1.09; reticulations on cornicles, .20; cauda, .54 to .63. Apterous oviparae.—Across eyes, .51 to .54; body, 2.52 to 2.90; antennal III, .80 to .84; IV, .64 to .72; V, .65 to .73; VI base, .19 to .21; unguis, 1.09 to 1.20; hind tibia, 2.10 to 2.35; hind tarsus, .09 to .13; rostrum IV plus V, .22 to .23; cornicle, .80 to .98; cornicle reticulations, .22 to .28; cauda, .43 to .50.

STRUCTURAL CHARACTERS.—Secondary sensoria scattered, tuberculate, 25 to 36 along all of III in alatae, 14 to 20 on the basal three fourths of III in apterae and 12 to 20 on basal two thirds in oviparae; oviparae with about 45 to 85 sensoria on basal half of hind tibia, which is slightly swollen; lateral tubercles present on prothorax and all abdominal segments anterior to the cornicles, those just ahead of the cornicles more prominent than the others; rostrum reaching or surpassing hind coxae; reticulations at tip of cornicles covering about one fourth of the length; cornicles cylindrical, not much wider at base than at middle; cauda tapering, with a slight neck; hairs on body and appendages conspicuous and pointed, and not surrounded with pigmented spots at bases.

TAXONOMY.—This species keys out to *M. ruralis* in the key of Hottes and Frison (1931). It differs from *M. ruralis* in the following particulars: *M. ruralis* has secondary sensoria mostly on the basal two thirds of III in alatae, on basal one third of III in apterae, fewer in number (13 to 27 alate, 5 to 17 aptera); the body color is green; the cauda is green at the base; the antennal segments, cauda and cornicles are longer in proportion to body size. *M. verbesinae* has the secondary sensoria covering practically all of III in alatae and two thirds of III in apterae, more in number than *ruralis* (25 to 36 alate, 14 to 20 aptera); the body color is black or red; the cauda is entirely black; the antennal segments, cauda and cornicles are shorter in proportion to body size. In addition, *ruralis* feeds preferably on the stem of its host, getting on the leaves when crowded, while *verbesinae* usually feeds under the leaves, getting on the stems when crowded on the leaves. The number of sensoria on the hind tibiae of oviparae of *verbesinae* is less than one-half the number found on *ruralis*.

NOTE.—There seem to be two color varieties of this species, a condition perhaps of the same nature as in the pink and green forms of *M. solanifolii* (Ashm.). Some colonies contain all black individuals, or entire plants may have only black individuals, while the same is true of the red variety. On the other

hand, mixed colonies are often found. However, there is no structural difference between the two color varieties, and once cleared and on slides the two are indistinguishable.

Holotype alate viviparous female (marked) on slide with two other alatae and one apterous female, collection number L-316-46, April 5, 1946, on *Verbesina virginica.* Morphotypes. —Apterous viviparous female (marked) on slide with four other apterae, collection number L-364-46, May 4, 1946; apterous oviparous female, collection number L-386-46, October 27, 1946, both on *Verbesina virginica.* Collections as follows: L-12-44, July 26, 1944; L-87-45, June 6, 1945; L-96-45, July 17, 1945; L-147-45, September 6, 1945; L-148-45, September 6, 1945; L-315-46, April 4, 1946; L-316-46, April 4, 1946; all at Baton Rouge, La.; L-364-46, May 4, 1946, at Shreveport, La., and L-386-46, at Perry, La. All on *Verbesina virginica,* collected by the writer. Two slides from this series are in the collection of the Illinois Natural History Survey at Urbana, Illinois, and two more in the collection of A. N. Tissot, Gainesville, Florida.

Georgiaphis maxsoni new species

COLOR.—Not recorded before mounting. Body of apterae covered with white, mealy secretion.

MEASUREMENTS.—Alate viviparae.—Body, .97 to 1.14; across eyes, .24 to .28; antennal III, .17 to .19; IV, .06 to .07; V, .07; VI, .06 to .07 plus .02; hind tibia, .36 to .43; hind tarsus, .08 to .11; rostral IV plus V, .07 to .09. Apterous viviparae.—Body, 1.02 to 1.25; across eyes, .29 to .31; antennal III, .17 to .20; IV, .07 to .08; V, .08 to .09; VI, .06 to .08 plus .02; hind tibia, .42 to .51; hind tarsus, .11 to .14; rostral IV plus V, .10.

STRUCTURAL CHARACTERS.—Secondary sensoria hardly exceeding the diameter of the segments, 13 to 18 on III, 2 to 4 on IV and none on V and VI in alatae, none in apterae; primary sensorium on VI with 1 or 2 smaller sensoria near it; alatae with media of fore wings once forked; the hind wings with a distinct media, the cubitus absent or rudimentary; two small wax pore plates of a few facets on head between the eyes, a large oval wax pore on the mesonotum just ahead of the scutellum and a larger one almost covering the scutellum; apterae with wax pore plates on dorsum of head, thorax and abdomen quite extensive, nearly covering each segment and consisting of many small facets irregularly arranged; alate nymphs with abdominal wax pores similar to the apterae; compound eyes absent in apterae, but the ocular tubercles are very large, each with three large facets; tarsus in all forms longer than antennal IV, V or VI. The ocular tubercles of the alatae are strikingly large, also with three distinct facets each.

TAXONOMY.—This form was examined by Mr. A. C. Maxson, who believed it might be an undescribed species. It differs from

G. ulmi in having the length of antennal III only about three-fourths the length of IV, V and VI combined instead of subequal, antennal VI is longer than IV or V instead of shorter than either one, and the body is smaller.

The species is placed tentatively in the genus *Georgiaphis* on the basis of secondary sensorium and wax gland structure as suggested by Mr. A. C. Maxson. Until the complete life history is known, this seems to be the best generic position.

NOMENCLATURE.—The specific name was chosen in honor of Mr. A. C. Maxson of Longmont, Colorado, who has done much to further knowledge of the Eriosomatinae.

Holotype alate vivipara on slide with morphotype apterous vivipara, and with 3 other apterous viviparae and 3 alate viviparae (marked), L-74-45, Port Hudson, La., May 18, 1945, on *Ulmus americana*. Only one collection, taken by the writer. A slide of this collection is in the collection of Mr. Maxson.

Sanbornia juniperi Pergande

Sanbornia juniperi Pergande, 1920, in Baker, U. S. D. A., Bul. 826: 50.

A single large collection of *Sanbornia juniperi* Pergande was made on red juniper in Baton Rouge, March, 1946, and isolated dead parasitized specimens were observed in Lafayette. Since the original description of this remarkable species is rather brief, it is here redescribed and figured in detail.

COLOR.—Green; head and thorax of alatae light brownish green; eyes dark brown; ocelli bordered with dusky; tip of antennal III and all of IV and V dusky; tarsi and tips of tibiae dusky; wing veins well marked; dorsum of apterae covered with a brittle film of transparent secretion which breaks into flakes upon handling. Nymphs with black wing pads.

MEASUREMENTS.—Alate viviparae.—Body, 1.27 to 1.40; across eyes, .32 to .38; antennal III, .15 to .22; IV, .09 to .11; V, .10 to .13 plus .08 to .11; hind tibia, .49 to .52; rostral IV plus V, .07 to .08; cauda, .16 to .18. Apterous viviparae.—Body, 1.20 to 1.53; across eyes, .40; antennal III, .16 to .21; IV, .08 to .11 plus .07 to .10; hind tibia, .38 to .44; cauda, .17 to .25.

STRUCTURAL CHARACTERS.—Secondary sensoria 4 to 6 on III and 2 on IV in alatae, none in apterae; apterae with an imbricated rectangular bilobed projection on the vertex, on each side of which is a broadly conicle protuberance, and with the first antennal segment bearing a finger-like process; eyes of apterae below the expanded sides of the head, body with similar expanded sides, and with the dorsum highly arched, bearing a tubercle at the highest point, the venter flattened; alatae with the vertex and antennal tubercles variable, usually the vertex with a short rectangu-

lar projecton; wing venation variable; media of fore wings usually once forked, but sometimes simple; cubitus forked at tip in one case; hind wings usually without a cubitus, but some specimens bear a trace of it, while other specimens have neither media nor cubitus in the hind wing. In some cases the alatae have 4-segmented antennae and in one case the aptera has 5-segmented antennae.

NOTE.—The Louisiana material of this species was compared by the writer with cotypes borrowed from the United States National Museum. There were 2 alates and 5 apterae in the cotypic material which were in a condition good enough for study. The Louisiana forms differ from the cotypes in being relatively larger and in having irregularities in the wing venation. A slide bearing specimens exhibiting most of the irregularities described above has been deposited in the United States National Museum, Catalog number 17280.

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INSECTICIDE TESTS FOR THE CONTROL OF FALL ARMYWORM ON CORN[1]

By A. N. TISSOT and L. C. KUITERT

Reports of heavy damage to lawns, peanuts, and corn by the fall armyworm, *Laphygma frugiperda* (A. & S.) during May and the early part of June 1948, indicated the necessity of further investigations for a more effective method of controlling this pest. Early in June Parathion, Chlordane, and DDT were used in several small scale experiments for the control of this pest in grass. Parathion gave kills far superior to those produced by the other materials. This was surprising in view of the fact that an earlier insecticide test on tobacco showed Parathion to be ineffective against the tobacco budworm, *Heliothis virescens* (F.).

An excellent opportunity for a more extensive test was presented when Doctor F. H. Hull of the Agronomy Department of the Florida Agricultural Experiment Station made avail-

[1] Contribution from Entomology Department, Florida Agricultural Experiment Station, Gainesville.

able a 1.6-acre field of young corn for an insecticide experiment. This field was bordered on one side by a field of older corn which had a very heavy infestation of the fall armyworm. Moths were constantly emerging and moving into the young corn to lay eggs. At one time there was a heavy migration of larvae from the old corn into the experimental planting. It thus is evident that the insecticides were tested under the most severe conditions possible, in so far as opportunities for reinfestation were concerned.

MATERIAL USED.—All of the insecticides were applied in the form of dusts. The materials tested, the formulations used, and the source of the materials, were as follows: (1) Isotox 1.5 percent gamma isomer, from California Spray Chemical Corporation; (2) Parathion 1 percent, prepared from 25 percent wettable powder, furnished by American Cyanamid Company; (3) Rhothane 3 percent, prepared from 50 percent wettable powder produced by Rohm and Haas Company; (4) Toxaphene 10 percent, prepared from a 20 percent dust made by Hercules Powder Company; (5) Lead arsenate, Corona Dry (98 percent) from Corona Chemical Division of Pittsburgh Plate Glass Company, mixed with diluent in proportion of 1:5 by weight; (6) Kryocide (90 percent sodium fluoaluminate) from Pennsylvania Salt Manufacturing Company, mixed with diluent in proportion of 1:1; (7) Chlordane 5 percent prepared dust obtained from a local insecticide store; (8) DDT 3 percent, prepared from 5 percent purified DDT dust made by Geigy Company, Incorporated; and (9) Methoxychlor 3 percent, prepared from Geigy Company 5 percent dust for the first two applications, from 50 percent Marlate obtained from E. I. duPont de Nemours and Company Grasselli Chemicals Department for the third application, and a commercially prepared dust made from Marlate, for the fourth application. In all cases where it was necessary to dilute the available materials to produce dusts of the desired concentrations, Pyrax was used as the diluent.

METHOD OF APPLICATION.—The insecticides were applied with rotary type hand dusters equipped with single discharge nozzles. An attempt was made to blow the dust directly into the bud whorls of the corn plants as most of the armyworm larvae were found there. Applications of insecticides were made June 19, 25, July 3, and July 16. In all cases the dusts were applied early in the morning between six and nine o'clock. At the beginning of the dusting operations the air was usually calm

and the corn was wet with dew. By the time the last material was applied the corn was almost dry and often there was a light breeze. In no case was the air movement strong enough to seriously interfere with the dust application. Later observations indicated that the slight drift of dust from one plot to another was of little consequence. To offset in a measure the effects of changing conditions during the application periods, the order of application of the various materials was reversed from one period to the next. The corn was about eight inches tall when the first dust application was made. A few tassels were beginning to show at the time of the last application.

An attempt was made to keep the rates of application as nearly uniform as possible, but in spite of all efforts to adjust the dusters, there was considerable variation in the amounts used of the different materials. This was due to the difference in bulkiness and ease of flow of the different insecticides. The rates of application for each material and the total amounts used during the course of the experiment are shown in Table 1.

PLOT ARRANGEMENT.—The corn planting made available to the writers for this test was a narrow field 640 feet long and 115 feet wide and containing 36 rows. A 20-foot buffer plot was marked off at each end of the field and the remainder was divided into three blocks of equal size. Each block was subdivided into 10 plots, each 20 feet in length and extending the entire width of the planting. The plots were separated by narrow furrows to facilitate dusting operations. This plot arrangement provided for three replications of the insecticides. The nine materials used and the untreated check were located at random among the 10 plots of each block. The corn was also being used for breeding purposes and only 19 rows known as the "June Composite" were harvested. Most of the larval counts were also made in these rows as the corn was more uniform since migrating larvae had severely injured several rows of the test plots on the side bordering the older corn.

EFFECTIVENESS OF INSECTICIDES.—On June 23, four days after the first insecticide application, larval counts were made to determine the effectiveness of the various materials. In each plot 10 plants, each in a separate row, were examined carefully for larvae. The plants were selected at random and all were taken well in from the plot borders to avoid any possibility of contamination by a neighboring insecticide. This same procedure was followed in subsequent larval counts.

TABLE 1.—INSECTICIDE TESTS AGAINST FALL ARMYWORM ON CORN.

Insecticide	Amounts Applied, Pounds per Acre					Larval Counts*				Corn Yields
	6-19-48	6-25-48	7-3-48	7-16-48	Total	6-23-48**	6-29-48	7-6-48	Total, Last Two Counts	Total from 3 Plots, Pounds
1. Isotox, 1.5% gamma isomer ..	18.9	24.0	18.6	37.3	98.8	244	27-187†	57-115†	84-302†	11.1
2. Methoxychlor, 3%	23.0	48.6	43.9	33.6	149.1	135	49-120	39- 67	88-187	6.9
3. Parathion, 1% ..	22.1	36.6	32.6	40.3	131.6	122	5-101	10- 88	15-189	17.7
4. Rhothane, 3%	20.1	38.0	31.3	41.3	130.7	130	22-209	44- 42	66-251	4.3
5. Toxaphene, 10%	25.3	34.6	40.0	46.6	146.5	112	2-260	14- 44	16-304	22.5
6. Lead Arsenate, diluted 1:5	14.9	38.0	33.0	39.0	124.9	154	46- 97	61- 35	107-132	0.8
7. Kryocide, diluted 1:1	22.1	30.6	31.6	41.9	126.2	88	51- 96	59- 95	110-191	2.8
8. Chlordane, 5% ..	24.0	30.0	34.0	37.0	125.0	223	15-233	37-137	52-370	3.5
9. DDT, 3%	30.5	36.6	34.3	38.0	139.4	99	19-129	55- 70	74-199	7.5
10. Check	0.0	0.0	0.0	0.0	——	198	68- 38	50- 15	118- 53	0.4

* Ten plants in each plot were examined. The counts for the three plots receiving the same treatment are combined and the figures given thus represent the number of larvae on 30 plants.

** Includes all larvae on the plants at time of observation.

† First number in these columns refers to larvae assumed to be present at time of application; second number refers to early instar larvae assumed to have hatched subsequent to application.

When the results of the first count were tabulated it was obvious that larval counts alone would not be a good criterion of the effectiveness of the different materials. There was no correlation between the number of larvae found and the amount of insect damage in the corn. It was therefore decided to examine the corn in all the plots at frequent intervals and attempt to rate the different materials on the basis of the general appearance of the corn and the amounts of larval feeding noted. These observations soon showed that the plots receiving Toxaphene and Parathion were outstandingly better than the others, and this superiority continued to the end of the experiment. There was some difference of opinion from time to time as to which was the better but when the entire period was considered they were rated equally good.

The next group in order of effectiveness included Isotox, DDT, Methoxychlor, and Rhothane. There was a noticeable variation in the different plots receiving the same treatment but when all plots were considered the materials were rated in the order named. The Chlordane plots showed the greatest amount of variation. The plants were very uneven in size and the larval damage also was spotted. On the whole the Chlordane plots were definitely inferior to those named in the group immediately above.

Kryocide and Lead Arsenate treated plots were only slightly better than the check plots. All of the plants in these plots were severely injured by the larvae and many were completely destroyed.

When the first larval counts were made it was noted that many of the larvae were very small and that they obviously had hatched after the insecticide application was made. The insecticides apparently had no deterrent effect on the moths, which continued to lay eggs in large numbers. It also was evident that none of the materials used had any appreciable residual effect under the conditions of this test, since young larvae could be found in all plots four days after the insecticides were applied.

In the second and third larval counts an attempt was made to differentiate between the larger larvae which were believed to have been on the corn at the time the insecticides were applied and the small ones which presumably hatched after the insecticide application. The two groups of larvae were counted separately and they are thus recorded in the larval counts shown

in Table 1. It will be noted that when only the larger larvae are considered there is a close correlation between the number of larvae found on the corn and the evaluation of the effectiveness of the insecticides on the basis of larval damage to the corn.

As a further aid toward evaluating the different insecticides, yield records of the corn were taken. Where the insecticides gave effective armyworm control, the corn made a large, vigorous stalk growth. The plants in the Parathion and Toxaphene plots averaged about 10 feet in height; however, even in the best plots very few ears were produced. The corn was planted June 4, and the lateness of planting undoubtedly was the factor most responsible for the poor yield. Other factors which may have contributed to the low production were a heavy infestation of the corn lantern-fly, *Peregrinus maidis* (Ashm.), and some damage caused by armyworm larvae entering the ears.

As stated above, the corn from only 19 rows was harvested. The yields given in Table 1 represent the combined production for the three plots of the same treatment, or an area of 3477 square feet. Although the yields are too low to have much significance, it is interesting to note that the Toxaphene and Parathion plots produced far more corn than any other treatment. The table also indicates that there was a rather close correlation between the yields for the other materials and the rating of the insecticides made on the basis of larval counts and armyworm damage.

INSECTICIDE PHYTOTOXICITY.—Kryocide was the only insecticide tested that caused observable injury which could be attributed definitely to the insecticide. In the plots receiving this material, the corn showed extensive dead, brown areas in the lower leaves while the upper, younger leaves were chlorotic in appearance. These symptoms were so pronounced that the Kryocide plots could easily be recognized by them.

It was mentioned that the Chlordane plots had an uneven and spotted appearance. Groups of plants scattered about the plots were as large and healthy as those in the Parathion and Toxaphene plots. Neighboring plants often were only half as large and some plants were twisted or otherwise deformed. This was most noticeable toward the end of the experiment when it served to identify the Chlordane plots. The cause of this disturbance was not determined but it seemed probable that the insecticide in some manner was responsible.

DISCUSSION.—The distribution of armyworm larvae among the various plots was very puzzling at first. When all the larvae were counted together without regard to size, it was noticed that there was no correlation between the number of larvae present and the amount of damage to the corn. In later counts when the late instar larvae and the newly hatched ones were counted separately, the situation became more clear. Reference to Table 1 shows that the combined totals of the last two counts for the three Parathion plots totaled only 15 late instar larvae, and for the Toxaphene plots 16 larvae. The same plots showed early instar larvae totals of 189 and 304 respectively. In contrast, the three check plots had 118 late instar larvae and only 53 newly hatched ones, while the poorest insecticide, Lead Arsenate, showed counts of 107 large larvae and 132 small ones.

A possible explanation of this situation is that the female moths avoided plants having late instar larvae and accumulations of frass in the buds and went elsewhere to lay their eggs. It also is possible that the larger, uninjured leaf area and the more healthy condition of the plants in plots treated with the more effective insecticides actually rendered them more attractive to the moths. It was noted that moths frequently were found hiding in the buds of uninjured plants while they were seldom seen in badly eaten ones.

About the time of the third insecticide application it was noticed that a heavy infestation of the corn lantern-fly was developing in the corn. Enormous numbers of these insects were found in the Check and Rhothane plots and they were fairly numerous in most of the other treatments. They were considerably less numerous in the Parathion and Toxaphene plots. In heavily infested plants the honey dew excreted by the lantern-flies collected in the whorls of the plants in large quantities. This honey dew fermented and sometimes scalded the tender leaves and caused them to turn white. In extreme cases the buds of the plants were completely destroyed.

CONCLUSIONS.—The insecticide tests reported here demonstrate that dusts containing 10 percent Toxaphene and 1 percent Parathion give effective control of the fall armyworm on corn under the most severe conditions of infestation. Isotox dust containing 1.5 percent gamma isomer, 3 percent DDT dust, 3 percent Methoxychlor dust, and 3 percent Rhothane dust, though somewhat less effective, show promise and probably

would give satisfactory control under conditions commonly found. Five precent Chlordane dust also was fairly effective in controlling the armyworm but apparently it somehow affects the corn adversely. Kryocide and Lead Arsenate are quite ineffective against the armyworm and the former is definitely phytotoxic to the corn.

TAXONOMIC AND DISTRIBUTIONAL NOTES ON THE HYDROMETRIDAE OF FLORIDA (Hemiptera)

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The family Hydrometridae is represented in the United States by seven species. One of these, *Hydrometra lillianis* Bueno, is confined to southern California. The other six, *H. martini* Kirkaldy, *H. myrae* Bueno, *H. barei* Hungerford, *H. wileyi* Hungerford, *H. australis* Say, and *H. hungerfordi* Bueno have been recorded from Florida. Most of the records, however, represent isolated collections. In the case of *wileyi*, the only record is "collected in Florida" (Hungerford 1934). Further, the recording of *martini* for peninsular Florida is doubtless an error. The following account is a summary of all of the known locality records for the species and a possible explanation for the erroneous recording of *martini*. The records of Blatchley (1926) have been omitted since the only two Hydrometrids known by him from Eastern North America were *martini* and *australis* and his descriptions indicate that he probably had several species involved.

KEY TO THE HYDROMETRIDAE OF FLORIDA[1]

1. Pits on pro- and meso-acetabula normally 2 ..... 2.
1'. Pits on pro- and meso-acetabula 4 or more ..... 4.
2. 2nd antennal segment 2½ times segment one ..... *H. myrae* Bueno
2'. 2nd antennal segment not more than twice segment one ..... 3.
3. Male processes on ventral side of sixth abdominal segment linear, oblique and located near anterior margin; female spine long, sharply acuminate, surpassing tip of body by almost ½ its length, segment including spine ⅘ths of preceding segment ..... *H. barei* Hungerford
3'. Male processes thin, transverse platelike elevations; female spine short, surpassing tip of body by not more than ⅓rd its length ..... *H. martini* Kirkaldy
4. More than 4 pits present, usually 8-10 ..... *H. wileyi* Hungerford

[1] *H. martini* is included for completeness.

4'. Pits normally 4 ..... 5.
5. Anteocular distance subequal to postocular distance; metanotum ½ length of pronotum ..... *H. hungerfordi* Bueno
5'. Anteocular distance 2½ times postocular distance; metanotum ⅔rds length of pronotum ..... *H. australis* Say

Hydrometra martini Kirkaldy

This is probably the best known North American species of the genus. It has been reported from almost the entire Eastern United States, from the Cayman Islands (Hungerford 1940) to Canada. It appears, however, in view of its generalized aspect, that it has been cited in error from many localities. Two years collecting in the state and the examination of certain specimens collected previously in Florida has yielded not one specimen that can be referred to *martini*. Very little collecting has been done in west Florida, and the species may occur in that region, since some piedmont forms occur there and nowhere else in the state.

Hydrometra myrae Bueno

This species was described by Bueno (1926) from Billy's Island, Okeefeenokee Swamp, Georgia. Although Blatchley (1928) lists this species in his supplement to the *Heteroptera of Eastern North America*, he gives no Florida records. *Myrae* is closely related to *martini* but its more elongated general aspect, particularly the more exaggerated outlines of the terminal segments of the abdomen, distinguishes the species immediately. In addition, the second antennal segment is two and one-half to three times the length of segment one, while in *martini*, it is only twice as long. Since *myrae* was not described until 1926, many of the records of *martini* previous to that time are naturally referable to this species. *Myrae* is the most prevalent *Hydrometra* in the state.

Specimens of *myrae* from southern Florida appear to be extreme in exaggeration of the terminal segment of the abdomen and in the length of the second antennal segment which, in many specimens, is very nearly three times the length of segment one. This form was taken on two occasions from salt-water tide pools. These pools were five to ten feet from the open gulf and were covered by salt water at high tide. The margins of these ponds were surrounded by thick growths of fern. There was hardly any living vegetation in the water.

Specimens were taken from small rafts of decaying stems of *Juncus roemerianus* Scheele.

SPECIMENS EXAMINED:[2] *Alachua Co.:* Pond "C", 3 miles southwest of Gainesville, May 18, 1933 J. Kilby 2♂, 3♀, 1 nymph; March 1, 1937 R. B. Van Dame 1♂, 3♀; Lake Alice, May 24, 1938 S. H. Spurr 1♂, 2♀ 1n; San Felasco Hammock Pond, October 5, 1948 F. N. Young 1♂; Sinkhole Pond, March 20, 1947 15♂, 17♀, Rocky Creek, 8 miles north of Gainesville, February 7, 1948 3♂, 2♀; Twin Oaks Pond, August 8, 1946 1♂, 1♀; August 13, 1946 H. G. Dowling 1♂; Blues Creek, 6 miles northwest of Gainesville, February 3, 1948 3♀, April 10, 1947 9♂, 7♀, September 11, 1947 1♀; Woods Pond, west end of Payne's Prairie, March 27, 1943 J. S. Rogers 1♀; Lake Wauberg, April 30, 1938 J. Preer 2♂, August 15, 1946 1♀; Lake Santa Fe, December 4, 1947 E. D. McRae 1♀; Cypress-Gum Swamp, 5 miles southeast of Gainesville, January 31, 1948 1♂; Santa Fe River, May 14, 1934 H. T. Townsend 1♀; Flatwoods Pond, 500 yards north of River Styx, April 13, 1947 8♂, 12♀, 2n; River Styx, April 13, 1947 4♂, 6♀, January 31, 1948 2♂, 2♀; Payne's Prairie, April 13, 1947 5♂, 2♀, November 23, 1947 3♂, 1♀; Biven's Arm of Payne's Prairie, March 2, 1946 W. Beck 1♀; March 6, 1947 24♂, 15♀, August 12, 1947 6♂, 8♀, 1n, November 13, 1947 1♂, 1♀, 1n; Hogtown Sink, 4 miles southwest of Gainesville, January 5, 1947 1♂, March 13, 1947 11♂, 3♀, May 1, 1947 6♂, 3♀; Sinkhole Pond, 3 miles southeast of Gainesville, March 9, 1934 H. T. Townsend 2♂, 3♀, May 25, 1934 H. T. T. 1♂, 1♀, October 17, 1934 H. T. T. 1♂, 1♀, November 10, 1934 H. T. T. 1♂, November 22, 1934 H. T. T. 2♀, December 8, 1934 H. T. T. 1♂, January 3, 1935 H. T. T. 2♂. *Baker Co.:* Roadside ditch, 4 miles south of Baxter, April 17, 1947 3♂, 5♀. *Dade Co.:* Paradise Key, September 1, 1925 T. H. Hubbell 1♂ (University of Michigan Collection). *Dixie Co.:* Little Fannin Springs, May 23, 1947 6♂, 3♀, Suwannee River, U. S. Highway 19, September 9, 1947 4♂, 6♀, 1n. *Franklin Co.:* Dog Island, April 16, 1947 F. N. Young 1♂, 1♀. *Hernando Co.:* Bayport, Flatwoods pond, September 26, 1948 2♂; Bayport, Palm Point, March 20, 1948 1♀; Bayport, tide pool, March 20, 1948 1♂, 1♀; Bayport, Coogler Dock, April 25, 1948 1♀; Salt Creek, 2 miles east of Bayport, January 29, 1948 9♂, 11♀, June 20, 1948 1♂, 1♀, April 25, 1948 2♀, May 22, 1948 8♂, 3♀; Weekiwatchee River, November 1, 1947 4♂, 5♀, 1n, November 2, 1948 1♂, 1♀. *Highlands Co.:* Highlands Hammock State Park, September 4, 1948 J. C. Moore 1♂. *Levy Co.:* Williston, Hammock Pond, March 22, 1947 J. Grant and K. Strawn 1♂, 1♀; roadside stream, 4.8 miles north of Cedar Key, October 12, 1947 1♂, flatwoods pond, 10 miles northeast of Cedar Key, October 12, 1947 5♂, 9♀, 1n; freshwater marsh, 4 miles east of Cedar Key, April 19, 1947 I. J. Cantrall 2♂, 12♀. *Marion Co.:* Sinkhole Pond, Ocala National Forest, February 26, 1938 J. R. Preer 1♂. *Monroe Co.:* Big Pine Key, limestone pit, November 27, 1947 1♂. *Palm Beach Co.:* 1 mile north of Okeechobee road (Fla. Hy 716), West Palm Beach Canal, June 11, 1947 4♂, 5♀. *Putnam Co.:* Little Orange Creek, January 18, 1948 2♂, 2♀.

[2] All specimens were collected by the author and are in the author's private collection unless otherwise noted.

Hydrometra barei Hungerford

This species was described by Hungerford in 1927 from two pair taken at Plant City, Hillsboro County, Florida. It is the smallest of the Florida forms and is easily distinguished from *myrae* and *martini*. Available collections show that it inhabits the southern tip of the state and probably occurs along the Gulf Coast as far west as Franklin County and as far north as Seminole County along the Atlantic Coast. Hungerford (1934) reports that specimens from the following localities are in the University of Kansas Collection: *Alachua Co.:* Archer; *Collier Co.:* Naples; *Dade Co.:* Homestead; *Seminole Co.:* Sanford. These specimens were collected by the University of Kansas Entomological Expedition in July and August 1930.

SPECIMENS EXAMINED: *Palm Beach Co.:* Military Trail, 1 mile north of Okeechobee road, West Palm Beach Canal, June 11, 1947 9♂, 1♀. *Franklin Co.:* Dog Island, freshwater marsh, April 16, 1947 F. N. Young 1♂, 2♀.

Hydrometra wileyi Hungerford

This species, the largest of the Florida *Hydrometra*, was described by Hungerford (1923) from 362 specimens collected by Mrs. Grace Wiley, near Rock Island, Colorado County, Texas. Since that time it has been recorded from "Florida".[3] The only records that I have are from Salt Creek, a clear, calcareous stream in Hernando County. Most of the specimens were collected from rafts of leaf debris that had collected in small coves along the shore. Occasional specimens were taken from the leaves of *Cladium* sp., which grows along the shore and in the edge of the water.

SPECIMENS EXAMINED: *Hernando Co.:* Salt Creek, 2 miles east of Bayport, January 29, 1948 11♂, 16♀, March 20, 1948 4♂, 4♀, May 23, 1948 3♂, June 19, 1948 2♂, 2♀; June 20, 1948 1♂. (All of the above collected by the author and J. Kilby.)

Hydrometra australis Say

Australis does not appear to be a common species in Florida. Although it has been collected from a calcareous stream in company with *wileyi* and from a hammock pond with *myrae*, it has been taken most frequently in cypress-gum swamps and acid streams. The banks of the latter usually are covered with growths of sphagnum moss.

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[3] *Loc. cit.*

SPECIMENS EXAMINED: *Alachua Co.:* Rocky Creek, 8 miles north of Gainesville, February 7, 1948 1♂, 3♀; Blues Creek, 6 miles northwest of Gainesville, February 3, 1948 1♀; April 10, 1947 7♂, 4♀; Sugarfoot Hammock Pond, 3 miles west of Gainesville, August 8, 1947 1♂. *Hernando Co.:* Salt Creek, 2 miles east of Bayport, January 29, 1948 1♀, May 22, 1948 1♀, September 26, 1948 1♂, 1♀. *Levy Co.:* 4.8 miles northeast of Cedar Key, October 12, 1947 1♀. *Putnam Co.:* Little Orange Creek, January 18, 1948 1♂, 1♀.

Hydrometra hungerfordi Bueno

H. hungerfordi was described by Bueno (1926) from Atchinson and Leavenworth Counties, Kansas. I have not seen this species. The only Florida record is from Hilliard, Florida (Hungerford, 1934). The specimens were collected by R. H. Beamer and Paul Oman in 1930 and are in the University of Kansas Collection.

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PARATHION TOXICITY TO LIVESTOCK, PRELIMINARY TEST

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The use of parathion spray from airplanes for the control of the green peach aphid, *Myzus persicae* (Sulz.) in cigar-wrapper tobacco shades is receiving serious consideration. This study was begun to determine the effect such a spray might have upon livestock grazing in pastures adjacent to treated shades. When the sprays showed no apparent ill-effects upon the stock it was decided to subject the animals to tests using 1 percent parathion dust.

One scrub yearling Jersey bull, 1 scrub yearling Jersey heifer and 1 hog, were used in tests 1 and 2. Only the 2 cattle were used in the remaining tests since the hog escaped at the beginning of the third. No ill-effects were noted on the hog at any time. During the course of each test the animals consumed only food which had been subjected to application of the insecticide. The oat plots had been seeded at the rate of 5 bushels per acre and were 8-10 inches in height at beginning of tests.

Due to limited number of animals and test plots it was impossible to conduct experiments which would meet strict research standards but it is believed that the animals were subjected to more severe conditions than will ever be encountered in normal situations. No check animals were used, the test was of relatively short duration, and feed supply was limited, however, it is hoped that some worthwhile knowledge will be derived from the work.

TEST NO. 1

On February 12, 1948, 1 yearling bull and 1 hog were put on a plot of green oats 20½ x 80 feet. The oats and animals were sprayed with parathion applied by airplane. Formulation used: 1.6 pounds 25 percent wettable parathion, 1 pint glycerin, plus water to make 2 gallons of solution. The material was applied at the rate of 1 gallon of solution per acre. Temperature at time of application was 70° F.

Immediately after application of the spray, 1 Jersey heifer was placed on the plot with other animals. After 4 days the animals were removed from oat plot because all feed had been consumed. At time of removal the animals appeared to be in excellent condition.

One pound of green oats was taken within 5 minutes after application, packed in dry ice and shipped by air to American Cyanamid Company, Stamford, Connecticut, for analysis. Sample showed 1.4 p.p.m. of parathion.

To determine the green peach aphid kill in this test, 2 potted tobacco plants were placed at each end of test plot. Results of this test, based on number of aphids on 1 leaf to each plant, are shown in Table 1.

TEST NO. 2

Test animals were the same as used in Test No. 1. February 17, 1948, the yearling Jersey bull and the hog were put

TABLE 1.—APHID COUNTS—TEST NO. 1—25 PERCENT WETTABLE PARATHION POWDER.

Plant Number	Before Application 2/12/48	After Application 2/13/48	2/15/48	2/16/48	
1	100	10	0*	0*	Flights made from
2	97	92	69	25	south to north, height
3	77	9	0*	0*	above ground about
4	103	37	0*	0*	14 feet or 5 feet
Check	93	85	80	78	above shade.

* Aphids on other portion of plant.

on plot of oats 20½ x 80 feet, then parathion spray applied by airplane. Formulation used: 1 pint 20 percent parathion emulsion (70 percent amyl acetate solvent), 1 gallon of water. Spray was applied at rate of 1 gallon per acre. Temperature at time of application was 70° F.

Immediately after application of spray the Jersey heifer was placed on plot with other animals. All animals were removed from plot after 4 days because of lack of food. Animals appeared in excellent condition at time of removal.

One pound of green oats was taken within 5 minutes after application and placed in a refrigerator. The sample was packed in dry ice February 18, 1948, and shipped to Stamford, Connecticut, for analysis. This sample showed 2.5 p.p.m. of parathion.

To determine the aphid kill, 1 potted tobacco plant was placed at each end of the oat plot and 4 plants under the adjacent tobacco shade, Storm King Slat cloth being used for shade. Results of this test based on counts as in Test No. 1 are shown in Table 2.

TEST NO. 3

Test animals were the same cattle as had been used in Tests 1 and 2. On February 24, 1948, the yearling bull was placed on plot of oats 61½ x 80 feet then 1 percent parathion dust applied with hand duster at the rate of 30 pounds per acre. Dust used was American Cyanamid Company formulation TA consisting of: 1 percent parathion, 89 percent filter dust, and 10 percent of a mixture of Attaclay and Pyrax. Temperature at time of application was 66° F.

Immediately after application of dust the heifer was placed on the oat plot. The animals remained on treated oats for 1

TABLE 2.—APHID COUNTS—TEST NO. 2—20 PERCENT PARATHION EMULSION.

Location of Plant	Before Application	After Application		
	2/17/48	2/18/48	2/19/48	2/20/48
North end of oat plot	176	95	81	120
South end of oat plot	160	0*	1	4
Sec. No. 1 from east side of shade	130	133	135	176
Sec. No. 3 from east side of shade	140	13	11	21
Sec. No. 4 from east side of shade	94	53	57	71
Sec. No. 5 from east side of shade	180	165	168	146
Check	70	105	164	217

Flight made south to north, height above ground about 14 feet or 5 feet above shade.

* Aphids on other portion of plant.

week and at time of removal showed no apparent ill-effects.

Three oat samples were taken from this test. The first sample was taken immediately after application, packed in dry ice and shipped to Stamford, Connecticut, for analysis. This sample showed 2.7 p.p.m. of parathion. The second sample was cut February 27, 1948, and air dried until being shipped March 1, 1948. This sample showed 5.5 p.p.m. of parathion. The third sample was cut March 1, 1948, air dried until March 5, 1948, when it was shipped for analysis. 2.6 p.p.m. of parathion was found on the sample. A word of explanation is necessary for the second sample. About ⅔ of this sample was destroyed by rats while it was being dried and it is possible that the rodents were selective in the material taken, leaving the straw with the larger amount of parathion.

To determine the aphid kill, 3 potted tobacco plants were placed in the oats plot and all given equal applications. Results of this test based on counts as in Test No. 1 are shown in Table 3.

TABLE 3.—APHID COUNTS—TEST NO. 3—1 PERCENT PARATHION DUST.

Plant Number	Before Application	After Application			
	2/24/48	2/25/48	2/26/48	2/27/48	2/28/48
1	100	23	0	0	0
2	100	20	0	0	0
3	100	28	0	0	0
Check	100	100	100	100	100

TEST NO. 4

Cattle used in the 3 previous experiments were used for this test. Both were feeding on oats at time of application, March 4, 1948. Six 20½ x 80 feet plots were in test area. Only 1 of these plots had not previously been treated with some type of parathion application. Entire area was hand dusted with 1 percent parathion dust at rate of 50 pounds per acre. Dust was mixed by American Cyanamid Company as their TP formulation. The formulation contained 1 percent parathion, 75 percent filter dust, and 24 percent of a mixture of Attaclay and Pyrax.

Only 1 sample of oats was taken from Test No. 4. This sample was taken immediately after application and air dried until March 9, 1948, when it was shipped to Stamford, Connecticut, for analysis. Residue of 9.5 p.p.m. of parathion was shown.

The test animals remained on the dusted oats until March 8, 1948, at which time they were removed due to scarcity of food. Rain amounting to 0.23 inches fell during the 24 hours preceding 9 A. M. March 5, 1948; 0.34 for the 24 hours preceding March 6, 1948, and 2.02 inches during the 24 hours preceding 9 A. M. March 7, 1948. At time of removal from oats cattle appeared in excellent condition.

No aphid kill tests were made since the 30-pound per acre application had given complete control.

EFFECTS ON TEST ANIMALS

After the test animals were removed from the oat plots on March 8, 1948, they were placed on clover pasture until time of slaughter March 15, 1948. Weight for yearling bull at time of purchase, January 14, 1948, was 240 pounds. Weight at time of slaughter March 15, 1948, was 390 pounds. Weight for yearling heifer at time of purchase January 14, 1948, 355 pounds. Weight at time of slaughter March 15, 1948, was 375 pounds. Doctors H. V. Porter and R. W. Porter submitted the following antemortem and postmortem report on the test animals:

"Herewith is submitted for your information a report of antemortem and postmortem findings at the Florida Packing Company of 2 animals:

"Bull: Antemortem—animal showed no apparent noticeable physical disturbance. Skin and appendages normal—eyes bright

—no lacrimal or nasal discharge—respiration normal—bowel regular for animal on grazing.

"Postmortem—gross anatomy normal with following exceptions: 1. Liver hypertophied 2½ times normal size with degenerated areas. 2. Portal lymph glands enlarged and congested slightly—gall bladder and contents normal. 3. All organs of digestion normal except highly parasitized.

"Heifer: Antemortem—general physical condition normal.

"Postmortem—gross anatomy normal exception: 1. Hypertophy of 200 percent of liver. 2. Colon congested slightly.

"Summary: Information we have concerning dosage and toxicity of drug is vague. We have no way of determining amount, if any, of this, insecticide consumed by these animals. Therefore, conditions found on postmortem cannot be attributed directly to the effect of this insecticide as producing the pathological condition found in the livers of these animals."

(Signed) H. V. Porter, D.V.M., R. W. Porter, D.V.M.

Table 4 summarized the tests as pertaining to livestock.

SUMMARY

This preliminary work shows that livestock is not immediately affected when sprayed with or consumes feed treated with normal applications of parathion. At no time were the animals off feed and for the type of animals involved the gains are considered normal. Only by long range intensive studies will it be possible to determine the ultimate harmful effects, if any, to livestock from parathion when used in crop protective work. In no way should this work be considered conclusive.

ACKNOWLEDGMENT

The writer is indebted to the following individuals and companies who made this work possible: Mr. J. D. Warner, Vice Director, Dr. R. R. Kincaid, Plant Pathologist and Mr. F. S. Baker, Jr., Assistant Animal Husbandman of the North Florida Experiment Station and Mr. Frank S. Chamberlain of the U. S. D. A. Bureau of Entomology and Plant Quarantine for their advice and assistance. To Dr. A. N. Tissot for editing and reviewing this manuscript. To Mr. Henry Weinberg and associates who provided the test animals, Mr. Arthur Corry of Aero Tobacco Sprayers who did the airplane spraying, the American Cyanamid Company which furnished the insecticide and made analysis for parathion residue on oats and Doctors H. V. and R. W. Porter who performed the autopsy on the test animals.

TABLE 4.—SUMMARIZED TESTS AS PERTAINING TO LIVESTOCK.

Test Number	Date Insecticide Applied	Material Used	How Applied	Rate of Application	Days Animals Fed on Treated Oats	Date Sample of Oats Taken	p.p.m. Parathion on Oat Sample	Condition of Animals at Time of Removal from Oats
1	2/12/48	1.6 lbs. 25% wettable 3422, 1 pint glycerine water to make 2 gals. of solution	spray from airplane	1 gal. of solution per acre	4	2/12/48	1.4	Apparently in excellent condition—all oats in test area consumed
2	2/17/48	1 pt. 20% 3422 emulsion (70% amyl acetate solvent) 1 gal. water	spray from airplane	1 gal. of solution per acre	4	2/17/48	2.5	Apparently in excellent condition—all oats in test area consumed
3	2/24/48	1% parathion 89% filter dust 10% Attaclay and Pyrax	dust from rotary hand duster	30 pounds per acre	7	2/24/48 2/27/48 3/1/48	2.7 5.5* 2.6	Apparently in excellent condition—all oats in test area consumed
4	3/4/48	1% parathion 75% filter dust 24% Attaclay and Pyrax	dust from rotary hand duster	50 pounds per acre	5	3/4/48	9.5	Apparently in excellent condition—all oats in test area consumed

Animals used in Tests No. 1 and 2: one scrub yearling bull, one scrub yearling heifer, one hog.
Animals used in Tests No. 3 and 4: same cattle as in Tests 1 and 2, hog escaped.
Bull at beginning of experiment weighed 240 pounds, at close 390 pounds.
Heifer at beginning of experiment weighed 355 pounds, at close 375 pounds.
Postmortem showed hypertrophy of livers on both animals which might have been caused by the insecticide.

* Rate destroyed about two-thirds of sample.

A NEW METROBATES FROM FLORIDA
(Hemiptera, Gerridae)[1]

By ROLAND F. HUSSEY
Lakeland, Florida

Metrobates anomalus, n. sp.

SIZE.—♂ 4.1 x 1.7 mm., ♀ 4.3 x 2.3 mm.; the widths measured across the mesothoracic acetabula. Alate form unknown.

COLOR.—Velvety black, the dorsum with very short appressed grayish pile, much more sparse on a broad median vitta of mesonotum and anterior lobe of metanotum; pronotum with the depressed orbicular median area ivory white (rarely with only a small yellow spot); head with an oblique dark rust-colored spot each side on vertex; sub-basal band on first antennal segment yellow or white; abdominal tergites each with a basal transverse wedge-shaped whitish area reaching each lateral margin, and in females also with a median quadrangular whitish area, not reaching the apical margin and obsolete on the apical segments. Beneath plumbeous, with the gula, anterior acetabula and ventral portion of middle acetabula ivory white; anterior trochanters honey yellow; anterior coxae and rostrum piceous, both provided with long yellow pile below; ventral abdominal segments narrowly margined with very short golden pile, sometimes obscured by blackening of the segmental margins; apical ventral segment and the genital segments (♂) sericeous golden pilose.

STRUCTURE.—Pronotum transverse, 2⅔ times as wide as long, its anterior margin sinuate in both sexes, the posterior margin sinuate in the male but nearly straight in the female; posterior margin of mesonotum broadly and shallowly sinuate in the male, less distinctly so in the female but with a most obsolete median notch; metanotum divided into two approximately equal parts (♀) by a very faint transverse curved suture ending in a deep impression at each side, this suture obsolete at middle in the male but the posterior lobe (♂) slightly depressed below the anterior one. Mesonotum with a faint median longitudinal suture; mesosternum likewise longitudinally sutured but this suture not percurrent at either end. Posterior margin of mesosternum distinctly sinuate. Female genital segments not withdrawn into venter. Connexivum of female flattened, mis-shapen in both specimens at hand, the inner margins parallel or nearly so; male connexivum rather strongly reflexed on basal segments, becoming oblique at the middle and nearly horizontal toward the apex. First tarsal segment of fore legs in both sexes with a comb of about eight setae, the proximal ones longest, the distal ones shortest.

MALE.—Antennal segments I-IV as 60:26:17:18; first segment gradually thickened on basal half, becoming about twice as thick as second segment, very short pilose below throughout its length and with its middle portion fringed with much longer hairs, much as in *M. hesperius* but this antennal comb less dense than in that species; second and third segments lightly curved and with the usual pairs of subapical combs found in this genus. Fore femora slightly incrassate and lightly sinuate; tibiae

[1] Contribution from the Biology Department of Florida Southern College.

slightly curved, with a strong blunt pre-apical spur on the inner side; ratios of femur to tibia to tarsal segments I and II as 60:45:6:18.

FEMALE.—Antennal segments simple, their lengths as 48:24:15:19; basal segment with only one or two long hairs on under side. Fore legs much as in the male, the femora a little less curved and the tibia without pre-apical spur.

I collected fifteen males and two females of this species July 11, 1948, in mid-stream on slow-flowing stretches of the Peace River shortly below its source at Kissengen Springs, near Bartow, Polk County, Florida. Following the heavy rains of mid-July, this stream overflowed broadly into the woodland at either side, and the current became imperceptible. No Gerridae of this species were found here on July 24, when I next visited this spot, nor were any seen on subsequent visits up to October 28. The holotype, allotype and paratypes are in my collection. A paratype is also in the Kansas University collection.

This is the only species of Metrobates that I know of whose male has the first antennal segment not longer than the apical three segments combined. The antennal structure of the female is much the same as in *M. hesperius*, as the first segment in both species is about one-sixth shorter than the other segments conjoined and these last do not show any significant differences in length either relatively or absolutely. The females of the two species differ markedly, however, in their coloration, and in *M. hesperius* the anterior lobe of the female metanotum is shorter than the posterior one, while in *M. anomalus* the two lobes are subequal or the anterior is very slightly longer than the posterior. In the female of *M. anomalus* the posterior margin of the metanotum is straight, while in *M. hesperius* it is lightly but distinctly sinuate. The dorso-ventral depth of the mesothorax is about the same in both species, being slightly less than the length of the fore femur in the female, and about one-fourth less in the male.

In Anderson's key to Metrobates (Kans. Univ. Sci. Bull. 20: 302, 1932) this species runs to *M. tumidus*, but in *tumidus* the coloration of the mesonotum is different, the appendages are described as having yellow and orange markings, and the first antennal segment in both sexes is *longer* than the other three conjoined.

A PRELIMINARY LIST OF THE Phyllophaga OF FLORIDA (Scarabaeidae: Melolonthinae)[1]

By FRANK N. YOUNG and WALTER H. THAMES

The following list of the species of *Phyllophaga* Harris, commonly called May Beetles, which have been recorded from Florida is presented to facilitate further work on the genus. An attempt has been made to include every valid species recorded from the state, but distributional and bibliographical data, other than those necessary to substantiate the records, are omitted since a more complete treatment is in preparation. W. S. Blatchley's summary of the species of *Phyllophaga* in his "Scarabaeidae of Florida" (1929) is the most recent published state list. Blatchley reviewed most of the previous Florida records and his work has been used as a starting point for the present list, which includes new species, new records, and recent changes in names and synonymy. The authors will appreciate corrections or additions to this list.

At present, 66 species of *Phyllophaga* are recorded from Alabama (Löding, 1945) and 70 species from Georgia (Fattig, 1944). A comparison of these lists with the following, which includes only 42 species, indicates that further collecting and study may materially increase the number of species.

Fortunately, Florida is not one of the states in which damage by May Beetles is extensive. Only a few species have been reported as sporadically damaging crops or groves. The principal reason for this lack of damage to agriculture is the apparent lack of swarms of the adults. This is probably owing partly to the scarcity of grasslands for breeding and partly to numerous parasites and other enemies.

The groupings of species used below are those of Horn (1887). The Böving groupings (1942) have not been used because it has not been possible to determine them for all species. Keys to the Horn groups, useful diagnoses, descriptions, and figures for many of the Florida species may be found in Langston (1927), Blatchley (1929), Sim (1928), Travis (1934), and in various other papers cited. The most important name changes are indicated in parentheses below each species name, but complete synonymy has not been attempted. The reference immediately following the species name is to the original de-

[1] Contribution from the Department of Biology, University of Florida.

scription. The species preceded by an asterisk (*) are additions to the state list based on the work of the present authors.

Phyllophaga youngi, Cartwright (1935) described from Brickell Hammock, Miami, Florida, is not included in the following list because it is believed that it is not a true member of *Phyllophaga*, but should probably be transferred to *Cnemerachis* Saylor, on the basis of structural characters.

We would like to express our appreciation for determination of specimens and other assistance to Mr. O. L. Cartwright and Dr. E. A. Chapin.

Phyllophaga Harris

Horn Group II

**cribrosa* LeC. (1853: 231)—?Orange County, H. T. Townsend. The occurrence of this typically western species in Florida is very doubtful. The specimen was probably mislabeled by Mr. Townsend. It may, however, occur in the xeric sand areas of the Central Highlands of Florida.

Horn Group IV

latifrons (LeC.) (1856: 241)—Locally abundant throughout the state. In South Florida it often appears at lights in enormous numbers.

prununculina (Burm.) (1855: 360)—Locally abundant throughout the state. Around Gainesville it sometimes occurs in damaging numbers on Oldfield Pine *(Pinus taeda)*.

**cerasina* LeC. (1856: 241)—Dade County, Miami, F. N. Young. Probably a variety or subspecies of *prununculina*.

elongata Linnell (1896: 725)—The types were from "Florida," collected by Chas. Palm. Blatchley (1929) also records it from Enterprise (Dietz).

pagilis Saylor (1937: 321) (*parva*//Linnell)—The types were from "Florida," collected by Chas. Palm. Blatchley (1929) also records it from Enterprise (Dietz). Marion County, in Big Scrub, T. H. Hubbell and J. J. Friauf, in UMMZ. This seems to be a species of the xeric scrub areas of the Central Highlands of Florida.

**schaefferi* Saylor (1937: 321) (*georgiana*//Schffr.)—Madison County, along Aucilla River opposite Lamont, F. N. Young and Lewis Berner. Apparently abundant in southern Georgia, but not previously reported from Florida.

glaberrima (Blanch.) (1850: 133)—Locally abundant throughout the state.

ephilida (Say) (1825: 196)—Recorded from Florida only by Horn (1887).

**uniformis* (Blanch.) (1850: 133) (*carolina* Fall)—Holmes County, near Bonifay, F. N. Young and Lewis Berner. Common in Georgia and northward, but not previously reported from Florida.

Horn Group V

clemens (Horn) (1887: 227) (*howei* Sanderson)—Apparently rare in the state. Sanderson's *howei* (1937) was described in part from Leon County.

**lota* Luginbill (1928: 87)—Wakulla County, near Sopchoppy, F. N. Young, *et al.* Two males of this species found trapped in pitcher plants in flatwoods near Sopchoppy seem to be the only Florida records.

Horn Group VI

dispar (Burm.) (1855: 361) (*boops* Horn)—Abundant in northern part of state, emerging later in summer than most species.

**austricola* Fall (1929: 110)—This is probably the *debelis* (LeC.) of older lists. The species is abundant on River Cypress *(Taxodium distichum)* along the Aucilla River and the St. Johns River. It does not seem to occur on the Pond Cypress *(Taxodium ascendens)*. Specimens from Enterprise on Lake Monroe are somewhat darker and differ slightly in other respects from those found along the Aucilla River.

**taxodii* Langston (1924: 449)—Madison County, along Aucilla River opposite Lamont, F. N. Young, *et al.* Found abundantly on River Cypress in June 1938 together with *austricola*.

gracilis (Burm.) (1855: 361)—Reported from Tallahassee, R. N. Wilson, collector (J. J. D.) by Blatchley (1929). Fairly common in southern Georgia.

futilis LeC. (1850: 226)—Gainesville and Lake City (Ag. Coll.), Blatchley (1929).

postrema Horn (1887: 233) (*quadrata* Smith = ♀ of *postrema?*)—Not uncommon in northern and western Florida. Lake City, Blatchley (1929). Liberty and Holmes counties, F. N. Young.

Horn Group IX

subpruninosa Casey (1884: 38) (*deani* Luginbill)—Jacksonville (Edward Tatnall), Horn (1887); Enterprise (Dietz), Ft. Reed (J. J. D.), Blatchley (1929).

micans (Knoch) (1801: 77)—Common in northern parts of state. The variety *cupulifornis* Langston occurs with the typical form.

diffinis (Blanch.) (1850: 138)—Duval County (Horn), Tallahassee (J. J. D.), Blatchley (1929).

floridana Robinson (1938: 110)—The types were from St. Petersburg, and the species is not uncommon over the central part of the state.

duvalis Robinson (1938: 110)—The types were from Lake City, Monticello, and Duval County.

ulkei Smith (1889: 94)—Rare in northern parts of state. Monticello, G. B. Fairchild.

fraterna Harris (1842: 29)—Enterprise (Schwarz), Blatchley (1929).

forsteri (Burm.) (1855: 325)—Marianna and Liberty County, Torreya Ravines, F. N. Young. This species occurs in western Florida,

but has probably been confused with *tecta* Cart. in the central parts of the state.

tecta Cartwright (1944: 32)—The types were from Gainesville and Bradenton. The species is not uncommon about Gainesville.

infidelis Horn (1887: 253)—Horn (1887). This record probably represents *ovalis* Cart.

ovalis Cartwright (1939: 353)—The types were from turkey oak uplands near Niceville and DeFuniak Springs. The species may be confined to the peculiar dry sand areas in that section of the state.

luctuosa (Horn) (1887: 254)—Tallahassee and Monticello, F. N. Young. Rare in western Florida.

**knochi* (Gyll.) (1817: 75)—Liberty County, Torreya Ravines area, F. N. Young. Apparently a characteristic species of the Altamaha Grit country of Georgia and occasionally found in Florida where similar environment occurs.

Horn Group XI

hirticula (Knoch) (1801: 79)—Tallahassee (Plant Board Coll.) and (J. J. D.), Blatchley (1929). Tallahassee, F. N. Young. Apparently rare in the western part of the state.

Horn Group XII

aemula Horn (1887: 271)—Haulover (Schwarz mss.), Blatchley (1929). Locally common in northern part of state.

crenulata (Froel.) (1792: 94)—Fairly common around Gainesville and elsewhere in northern part of state.

parvidens (LeC.) (1856: 259)—Fairly common on pines in Central Highlands area.

hesteropyga Davis (1920: 336)—Described from Sanford. This may be another species or form characteristic of the dry sand areas.

elizoria Saylor (1937: 321) (*pygidialis*//Schffr.)—Schaeffer described *pygidialis* from Indian River, Florida. Apparently it has been taken since only near DeSoto City where it was found attacking young orange trees in a recently planted grove. Apparently a rare, although locally abundant, species of the dry sand areas.

mariana Fall (1929: 111)—Described from a single male taken at Lake Mary, Seminole County. The species is not uncommon in the central and northern parts of the state. Gainesville, W. H. Thames; Jackson and Liberty counties, F. N. Young.

Horn Group XV

quercus (Knoch) (1801: 72)—Centreville (Schwarz ms.), Blatchley (1929). Gainesville, W. H. Thames, and T. H. Hubbell.

clypeata (Horn) (1887: 145)—Georgia and Florida (Horn); Enterprise (Fall), Blatchley (1929).

tristis (Fabr.) (1781: 39)—Haulover (Schwarz) and Ft. Barrancas (Ag. Coll.), Blatchley (1929). Not uncommon around Gainesville and

in western parts of the state. In Walton County it sometimes occurs in large numbers on *Quercus cinerea* in ecotones along the edge of flatwoods.

Subgenus *Phytalus*

*?*georgianus* (Horn) (1885: 120) (not *georgianus* Schffr.)—Record based on one female from Leon County, F. N. Young.

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INDEX TO VOLUME XXXI, 1948

Acroneuria abnormis (Newman), 23
arenosa (Pictet), 23
lycorias (Newman), 21
ruralis (Hagen), 23
sp. B. Frison, 23
xanthenes (Newman), 21
Agromyza maculosa Malloch, 63
Agromyzid leaf-miner, 62
Agrotis ypsilon (Rott.), 80
Annotated bibliography—Thysanopterists, 35
Anopheles quadrimaculatus Say, 57
Ant—Control of, 68
Aphididae n. sp., 95
Aphid, New on Sweet Potato, 24
Armyworm—Control of on corn, 105
Atoperla ephyre (Newman), 22

Benzene hexachloride, 29, 68, 81
Bidens pilosa, 62
Biological Control, 50
Braconidae, 63
Buffalo turbine, 31

Cabbage looper, 80
Chlordane, 11, 29, 68, 106
Chlorinated camphene, 11, 29, 68
Chrysocharis sp., 63
Cinara carolina Tissot, 99
louisianensis n. sp., 95
melaina n. sp., 98
occidentalis Davidson, 98
osborniana Tissot, 99
tujafilina (Del Guercio), 98
utahensis Knowlton, 98
Cnemerachis Saylor, 126
Concentrated Spray and Citrus Groves, 29
Corn lantern-fly, 110
Cuban fly, 50
Cutworms, 80
Cyrtopeltis varians (Dist.), 20

DDT, 11, 68, 81, 106
Diatraea saccharalis F., 50
Dicyphus minimus Uhl., 20

Entomological Progress, 64

Fall armyworm, 80
Fordini Tribe, 24

Georgiaphis maxsoni n. sp., 103
ulmi, 104
Gerridae, 123
Grasshoppers, 29
Green peach aphid, 20, 116

Heliothes virescens (F.), 105
Hession Microsol Generator, 31
Hexaethyl tetraphosphate, 81
Hydrometra australis Say, 115
barei Hungerford, 115
hungerfordi Bueno, 116
lillianis Bueno, 112
martini Kirkaldy, 113
myrae Bueno, 113
wileyi Hungerford, 115
Hydrometridae of Florida—Key, 112

Insecticide tests—Fall armyworm, 105
Insect vectors, 64
Isoperla confusa Frison, 23
Isoperlidae, 23
Isotox, 106

Kryocide, 106

Laphygma frugiperda (A. & S.), 80, 105
Lead arsenate, 106
Leaf-miner parasites, 62
Leptoglossus gonagra, 33
Leuctra decepta Claassen, 21
sp., 22
triloba Claassen, 22
Leuctridae, 22
Liriomyza pusilla (Meig.), 16
Little Fire Ant, 11
Lixophaga diatraeae Towns., 50

Macrosiphum luteola Williams, 100
ruralis, 102
solanifolii (Ashm.), 102
tissoti n. sp., 95, 100
verbesinae n. sp., 95, 100
Methoxychlor, 106
Metrobates anomalus n. sp., 123
hesperius, 124
tumidus, 124
Metrobates from Florida, 123
Myzus persicae (Sulz.), 20, 116

Nemoura venosa Banks, 22
Nemouridae, 22
Neoperla clymene (Newman), 22
Neophasganophora capitata (Pictet), 23
Nicotine alkaloid, 81
Nicotine sulphate, 81

Odynerus, 74
Oenonogaster n. sp., 63
Opius n. sp., 63

Parancistrocerus, 77
Parathion, 81, 106
Parathion toxicity to livestock, 116
Peregrinus maidis (Ashm.), 110
Perlesta placida (Hagen), 22
Perlidae, 22
Phyllophaga aemula Horn, 128
austricola Fall, 127
cerasina LeC., 126
clemens (Horn), 127
clypeata (Horn), 128
crenulata (Froel.), 128
cribrosa LeC., 126
diffinis (Blanch.), 127
dispar (Burm.), 127
duvalis Robinson, 127
elizoria Saylor, 128
elongata Linnell, 126
ephilida (Say), 126
floridana Robinson, 127
forsteri (Burm.), 127
fraterna Harris, 127
futilis LeC., 127
georgianus (Horn), 129
glaberrima (Blanch.), 126
gracilis (Burm.), 127
hesteropyga Davis, 128
hirticula (Knoch), 128
infidelis Horn, 128
knochi (Gyll.), 128
latifrons (LeC.), 126
lota Luginbill, 127
mariana Fall, 128
micans (Knoch), 127
pagilis Saylor, 126
parvidens (LeC.), 128
postrema Horn, 127
prununculina (Burm.), 126
quercus (Knoch), 128
schaefferi Saylor, 126
subpruninosa Casey, 127
taxodii Langston, 127
tecta Cart., 128
tristis (Fabr.), 128
ulkei Smith, 127
uniformis (Blanch.), 126
youngi Cartwright, 126
Phylophaga of Florida—List, 125
Plecoptera, 21
Pogonomyrmex barbatus (F. Smith), 68
Predacious Habit of Mirid, 20
Prociphilini Tribe, 24
Progress of Entomology, 64
Protoparce sexta (Johan.), 20
Pteronarcidae, 21
Pteronarcys dorsata (Say), 21
sp., 21
Pyrethrum, 81

Randomized-Block Arrangement, 1
Red Harvester Ant, 68
Reduviidae, 57
Rhopalosiphum pseudobrassicae (Davis), 80
Rhothane, 106

Sanbornia juniperi Pergande, 95
Scarabaeidae: Melolonthinae, 125
Schistocerca americana (Drury), 29
Serpentine Leaf Miner, 15
Stenodynerus ammonia, 74
australis, 71
beameri, 71
bicornis, 74
bifurcus, 71
clypeolatus floridanus, 73
fulvipes rufovestis, 74
fundatiformis, 73
histrio, 71
lineatifrons, 72
pedestris, 71
perennis anacardivora, 73
oculeus, 73
saecularis rufulus, 74
vagus slossonae, 74
Stenodynerus Saussure, 71
Stoneflies from Florida, 21
Sugarcane borer, 50

Taeniopteryx maura (Pictet), 21
nivalis (Fitch), 21
Taeniopterygidae, 21
Thysanopterists, Annotated bibliography, 35
Tobacco budworm, 105
Tobacco shades, 116
Togoperla immarginata (Say), 23
kansensis (Banks), 23
Toxaphene, 106
Toxicity of Parathion, 116
Triatoma, 57
Triatoma lecticularius floridana Usinger, 57
lecticularius (Stal), 57
megista Burmeister, 57
sanguisuga (Le Conte), 57
sanguisuga ambigua (Neiva), 57
Trichoplusia ni (Hbn.), 80
Trypanosoma cruzi (Chagas), 57
Turnip aphid, Control of, 80

Vespidae—Hymenoptera, 71

Wasmannia auropunctata (Roger), 11
Wire worms, 82

Xenipterygus gen. n., 24
Xenopterygus ipomoiae, sp. n., 24

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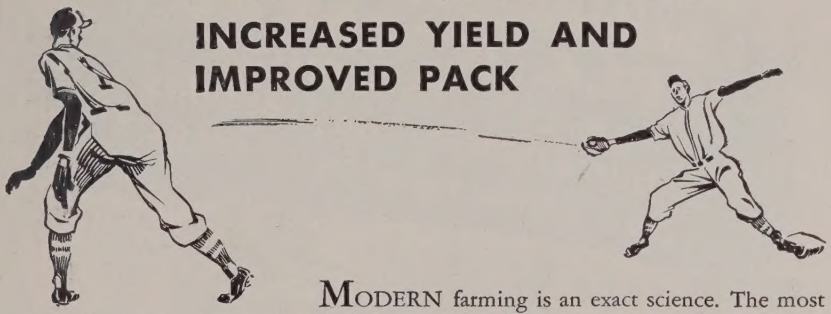

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